

State of California
The Resources Agency
DEPARTMENT OF WATER RESOURCES
Northern District

RECREATION USE SURVEY OF
INDIAN CREEK, PLUMAS COUNTY

1999

Technical Information Report ND-00-1

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This report was prepared to summarize information collected under SAP Internal Order 100493 to document recreation and fishery enhancement provided by a revised operation of Antelope Reservoir. This report has received only limited review; it is intended for internal use and should be considered preliminary and subject to revision.

December 2000
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SUMMARY

A survey of streamside recreation along upper Indian Creek, Plumas County, was made in 1999. This survey was made to estimate the amount and types of recreation occurring under revised operations and flow conditions. The random sample survey combined roving use counts with interviews of anglers to gather information on recreation use, activities, visitor origin, and angler success.

There were an estimated 19,000 hours of recreation use on 11 miles of Indian Creek between Antelope Dam and Flourney Bridge from April 24 to November 15, 1999. The most frequently observed activities were camping, fishing, relaxing, walking, and picnicking, but other miscellaneous activities combined to represent almost 16 percent of the use observed.

Similar to past surveys, about 40 percent of the visitors and 46 percent of the anglers interviewed were from the northeast counties of California. The Sacramento Valley was also well represented among visitors and anglers. Anglers creel about 1,400 rainbow trout, 800 brown trout, and at least 150 brook trout in 4,600 hours of fishing on this portion of creek.

This report revises an earlier version distributed in December 2000. It corrects errors in the estimated catch of brown trout and brook trout, provides more detail in the estimates of general recreation use, and fixes several other minor errors.

DESCRIPTION OF STUDY AREA

Indian Creek is a major tributary of the East Branch North Fork Feather River in Plumas County. The creek flows from Antelope Dam about 38 miles to its confluence with Spanish Creek near the junction of Highways 70 and 89, about 11 miles northwest of Quincy (Figure 1). The area has a rich history of gold mining, ranching, and lumber production. In recent decades, recreation use has become a predominant use, with water-related recreation a major attraction. Employment in the area today is divided among services, government, and timber harvesting and processing. Indian and Genesee Valleys support large cattle ranches.

Below Antelope Dam, Indian Creek flows through a granitic canyon with stands of pine and fir, but short reaches are often meadowlike. It is closely followed by a paved road with wide pullouts for convenient stream access. A portion of the creek cuts through a deep and rugged canyon, accessible only by foot, before flowing into the upper part of Genesee Valley. All but the lower one mile of the upper 11-mile reach is within Plumas National Forest.

The study reach of the stream remains cold in summer and is slightly turbid due to deep-water outflow from the dam. Brown trout and rainbow trout dominate the fishery. Many large trout (mostly rainbows, some brook trout) and warm water species such as black bass typically enter the creek from Antelope Reservoir during periods of spill (Rischbieter 1996). Spill can often be substantial, but in recent years (including 1999) spill has been delayed and minimized by revised winter operations.

In 1999, the streamflow maintenance release was held at 100 cubic feet per second (cfs) throughout April, with spill beginning on April 26. Spill increased to 217 cfs in late May, then declined to 23 cfs by the end of June. Spill ceased on July 3 and the streamflow maintenance release was held at 20 cfs for the rest of the year, except for a three-day reduction to 5 cfs in late August for fish population surveys.

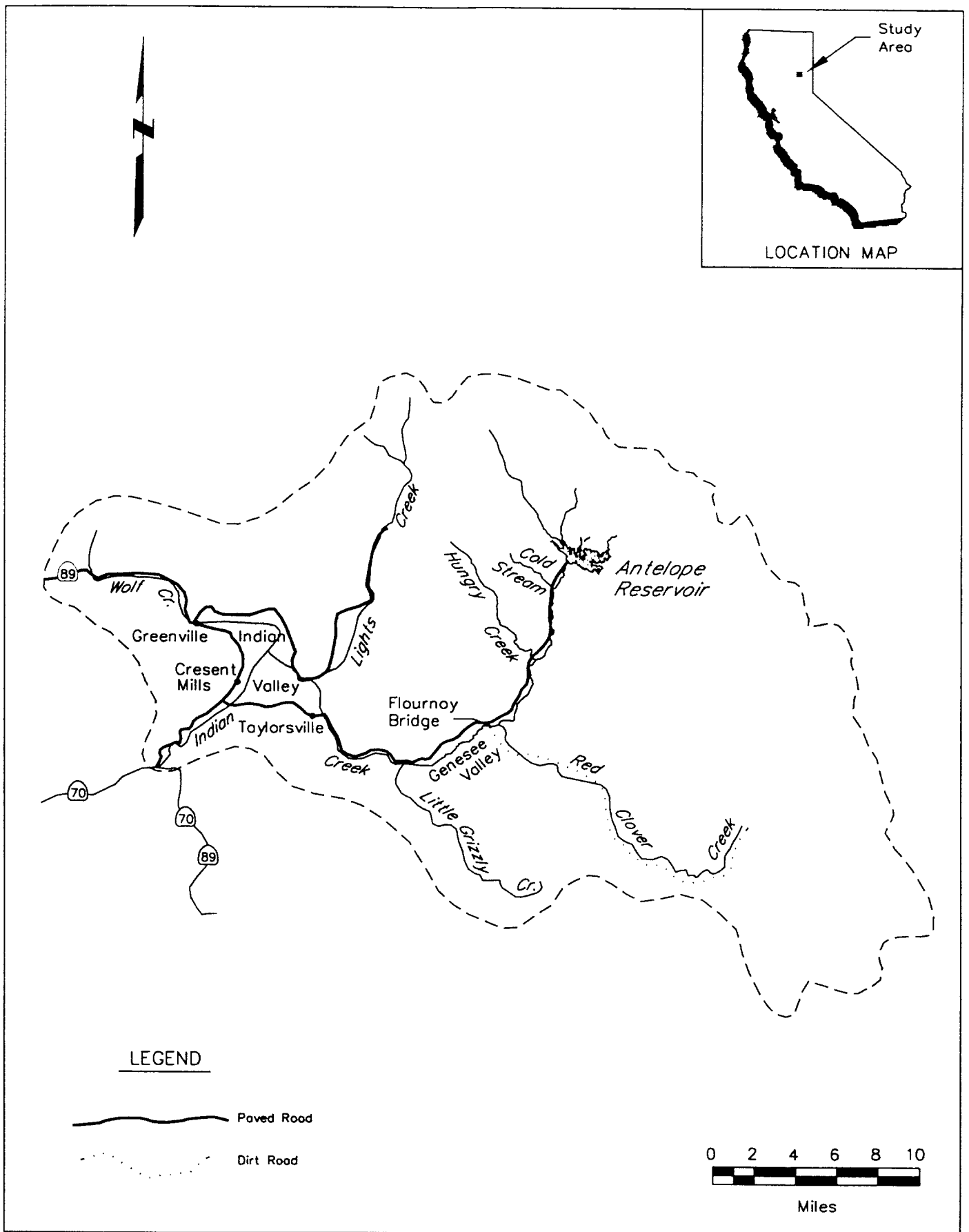


Figure 1 – Antelope Reservoir and Indian Creek, Plumas County, 1999

METHODS

Recreation Use Counts

Use counts were made on randomly selected dates within nine survey strata using the optimum allocation method described by Abramson and Tolladay (1959). Twenty-seven days of the 206-day period from April 24 through November 15, 1999, were surveyed: both days of the opening weekend of trout season, 4 of 9 holiday weekend days, 11 of 143 weekdays, and 10 of 52 general weekend days. Five one-hour counts of recreation use were made in the study area each day at regular periods, scheduled according to the number of daylight hours (Appendices I and II).

The surveys were made from a vehicle or on foot, as necessary, to check access areas and recreation sites. Recreationists (and their vehicles) were counted and recorded by recreation activity. The five daily counts were totaled and multiplied by factors that accounted for recreation use during the daylight periods not counted. Similarly, the resulting daily figures were expanded to estimate total recreation hours for all days in each stratum. Adding the stratum totals provided an estimate of recreation hours for the study period.

Creel Census

Anglers along Indian Creek were contacted on the same 27 survey days to determine fishing success. The county of residence and length of time spent fishing so far that day was recorded for each angler contacted. Creeled fish were counted, measured (fork length to nearest 0.5 centimeter [cm]), and identified to species.

To determine total catch, the catch per hour was multiplied by estimated hours of fishing for each stratum. Total weight of trout caught was calculated from estimated total catch and length-weight data from Indian Creek trout (Brown 2000).

RESULTS

Recreation Use

Total recreation use on Indian Creek, Antelope Dam to Flournoy Bridge, was estimated at 19,000 recreation hours for the period April 24 to November 15, 1999. Based on counts of recreationists, camping was the most common activity, followed by fishing, relaxing, and miscellaneous activities (Table 1). Use counts reflect what recreationists were doing when seen and the number of hours spent on each major activity, but did not provide data on other activities that people pursued at other times during their stay.

Table 1. Recreation Hours by Activity, Indian Creek, Antelope Dam to Flournoy Bridge - 1999

<u>Activity</u>	<u>Recreation Hours</u>	<u>Percent</u>
Camping	7,800	41
Fishing	4,600	24
Miscellaneous*	3,000	16
Relaxing	1,900	10
Walking	800	4
Picnicking	500	3
Gold Seeking	<u>400</u>	<u>2</u>
Total	19,000	100

*Includes children playing, bicycle riding, beach use/swimming, sightseeing, ATV use, and bird watching.

In addition to the use counts, 91 interviews of recreationists were conducted during the 1999 season, representing 225 people. The interviews provided more detailed information on activity participation and additional information on visitor characteristics.

About 64 percent of the recreationists interviewed said they fished during their visit to Indian Creek, about 51 percent said they would be “just relaxing”, and 33 percent said they would be sightseeing. Other activities included beach use/swimming/wading (21 percent), picnicking (16 percent), walking for pleasure (13 percent), and motorcycle/bicycle riding (7 percent) or off-road vehicle use (1 percent). About 16 percent of the people interviewed mentioned miscellaneous other activities. These percentages total well over 200 percent because many recreationists engaged in more than one activity during their visit.

About 40 percent of the visitors camped along Indian Creek, 42 percent were day users and returned home at night, and 18 percent stayed overnight somewhere in the area, but not at Indian Creek. Most of the latter camped at Antelope Reservoir, but a few stayed with friends or relatives in the area, at motels or resorts, private campgrounds, or summer cabins.

Recreation visitors to Indian Creek in 1999 came predominantly from the Northeast Counties (40 percent), and Sacramento Valley (28 percent). About 10 percent came from San Francisco Bay Counties, 7 percent from Mountain Counties, and 5 percent from other areas of the State. Ten percent came from out-of-State (mostly Nevada).

Creel Census Data and Angler Success

During the 1999 trout season, 167 anglers were contacted between Antelope Dam and Fournoy Bridge. They had fished 309 hours, with a recorded catch of 57 brown trout (Salmo trutta) and 99 rainbow trout (Oncorhynchus mykiss). Eight Eastern brook trout (Salvelinus fontinalis) were also observed in the creel. In addition, 122 trout and 1 bass were reported caught, or reported to have been caught and released.

Total angling use between Antelope Dam and Fournoy Bridge was estimated at 4,600 hours ($\pm 1,200$ hours) or 1,650 angler-days, with an estimated catch of about 1,400 rainbow trout, 800 brown trout, and 150 brook trout. Based on reported catch, or reported catch and release, more than 3,000 additional trout may have been caught and released, although this figure may be exaggerated by several anglers who reported

exceptional catches. One angler reported catching and releasing 15 trout and several others said they caught and released between five and 10 trout. These few anglers caught and released 70 percent of the 122 trout reported caught and released.

The mean length of 38 measured brown trout was 30.9 cm (12.2 inches [in]) with a range of 20.5 to 43.5 cm (8.1 to 17.1 in; Appendix III). The mean length of 85 rainbow trout was 30.0 cm (11.8 in) with a range of 15.0 to 42.5 cm (5.9 to 16.7 in; Appendix IV). Eight brook trout ranged from 21.0 to 30.5 cm (8.3 to 12.0 in) with a mean length of 26.3 cm (10.4 in). An estimated 1500 lb of trout were caught including all species.

Indian Creek angler origin (Figure 3) was similar to previous years: most of the anglers came from the Northeast Counties (45 percent) and Sacramento Valley Counties (36 percent). The San Francisco Bay area was not as well represented in 1999; only 6 percent of visitors came from those counties, whereas in previous years the representation has been higher. About 6 percent of the anglers were from out-of-State (all Nevada).

Overall, about 60 percent of the anglers censused fished with bait, 9 percent with lures, 13 percent with flies, and about 18 percent fished with some combination of bait and flies, or bait and lures.

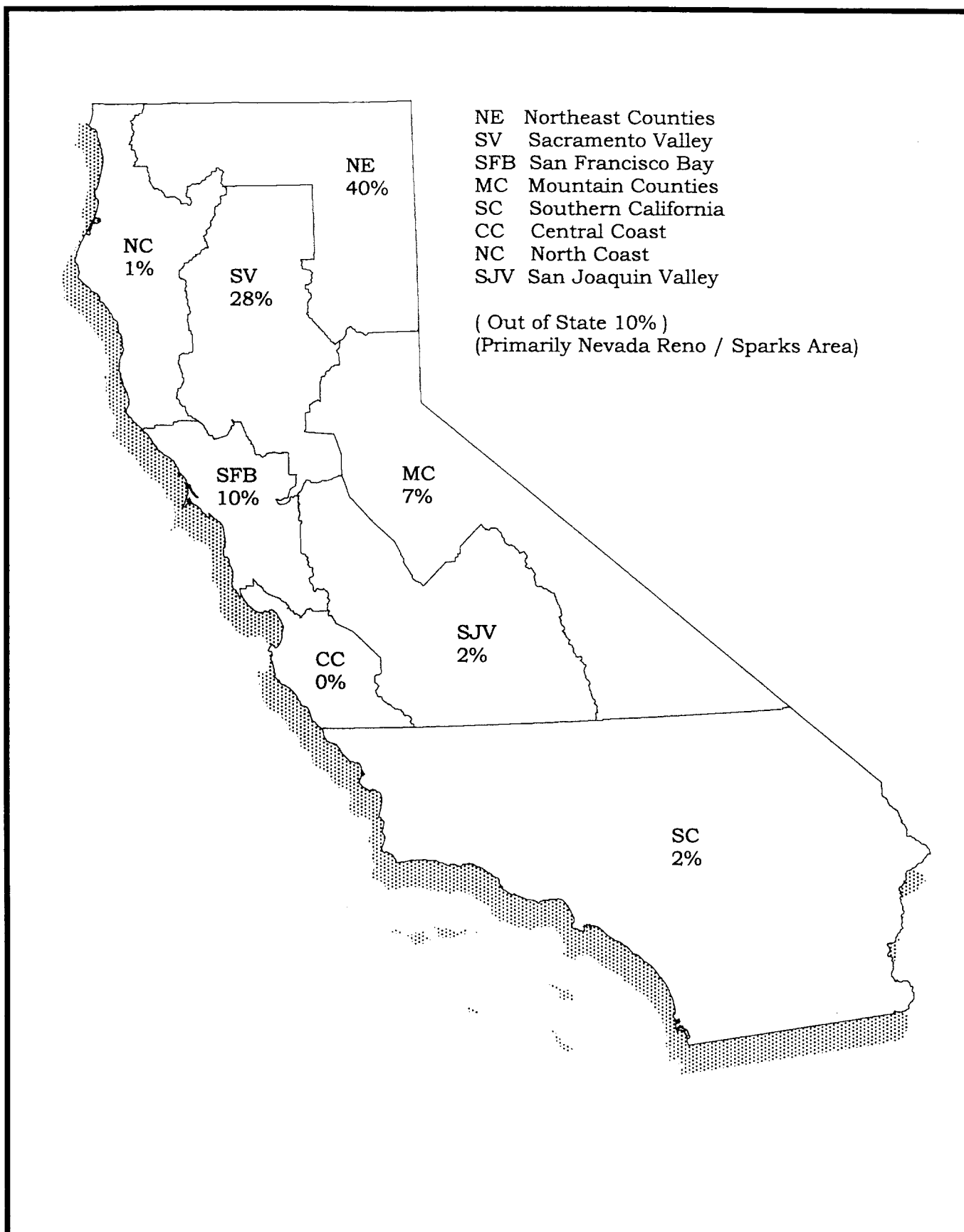
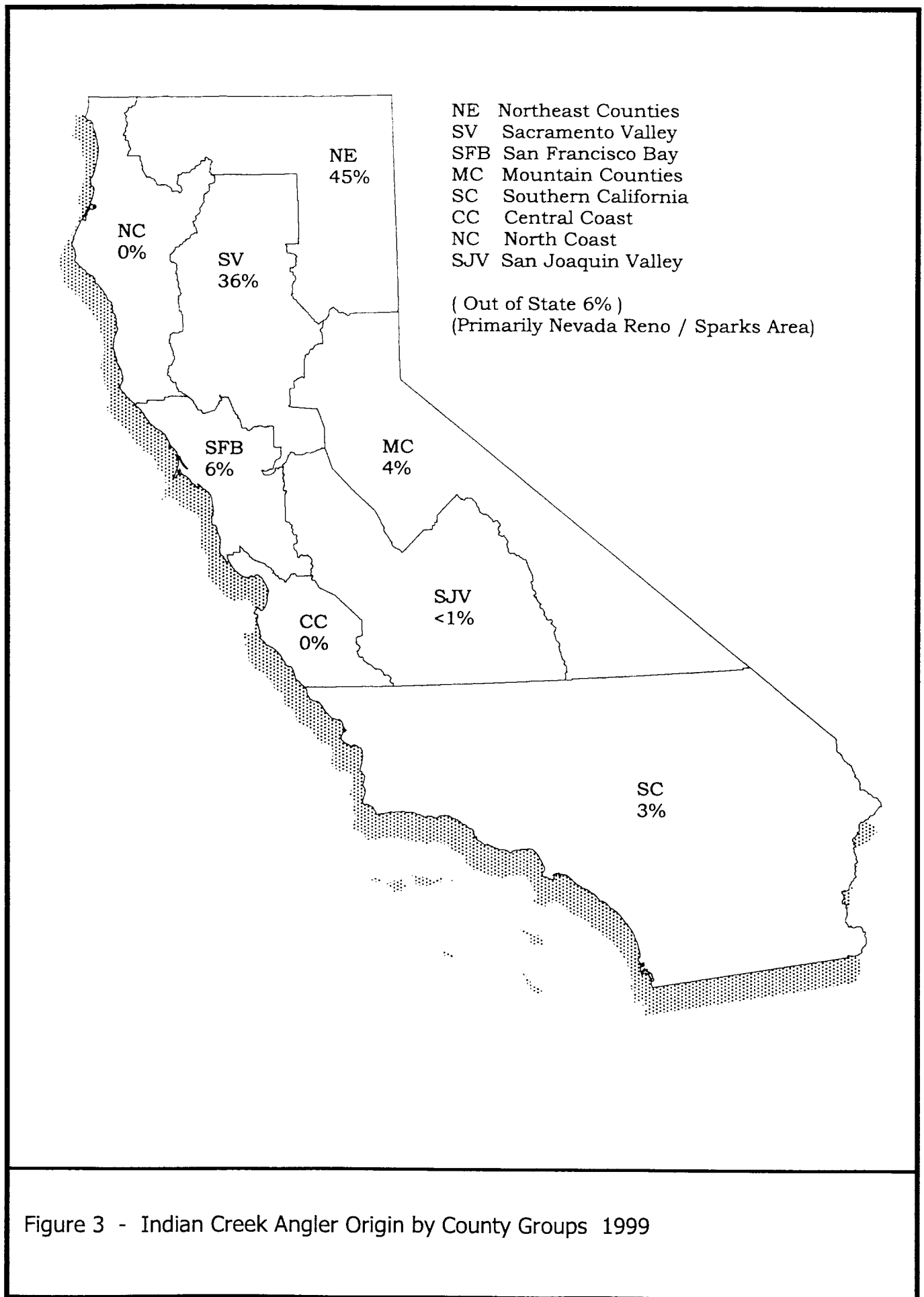


Figure 2 - Indian Creek Visitor Origin by County Groups 1999



DISCUSSION

Understanding the limitations of the recreation use survey and creel census helps put the data obtained in perspective. This section describes such contextual information and compares data from previous years with 1999 data.

Limitations of Use Counts and Creel Census

Most recreationists on the creek were readily observed during the use counts. Vehicle access points were checked on each count, but people were not found for some vehicles. Vehicles of U. S. Forest Service workers, loggers, and other non-recreationists often park along the road in this reach of Indian Creek, making vehicle counts a poor index of recreation use. We observed wood cutters, truck drivers, and U. S. Forest Service employees working along Indian Creek during the summer. We did not include them in the estimates of use because they generally did not engage in recreation along the creek.

It was unusually difficult to contact a statistically-sufficient number of anglers during 1999. Only about 7 percent of the estimated fishing use was represented in the creel census. Thus, the estimates of total catch must be regarded cautiously, especially since angler success varied tremendously (from 0.0 to nearly 1.0 fish/hr) among various strata.

Comparison of 1999 Results with Previous Surveys

The first three surveys of Indian Creek (1978-80) covered 38 miles from Antelope Dam to the confluence with Spanish Creek. In 1981, 1982, and 1986, the survey included only the 11 miles of the creek below Antelope Dam, as did this 1999 survey. Three more recent surveys included "middle" Indian Creek (Flournoy Bridge to Shim Flat; 1990, 1993, 1995). A comparison of data from all ten years (various authors, see References) illustrates patterns and changes that have occurred in general recreation, fishing, and angler success in the upper reach (Antelope Dam to Flournoy Bridge). Data from the upper reach has been separated for direct comparison in Table 2.

Table 2. Estimated Recreation Hours by Activity, Upper Indian Creek, 1978-82, 1986, 1990, 1993, 1995 and 1999¹

Activity	Year									
	1978	1979	1980	1981	1982	1986	1990	1993	1995	1999
Fishing	7,000	3,400	8,800	3,600	13,500	7,600	6,200	6,200	4,100	4,600
Camping	5,600	7,700	8,000	4,500	14,500	9,700	5,700	11,500	8,200	7,800
Relaxing	4,200	5,200	2,600	2,000	3,000	5,300	1,300	4,000	2,400	1,900
Picnicking	300	500	700	800	1,400	200	100	100	1,000	500
Gold Seeking	300	200	400	1,600	600	1,900	1,300	2,500	100	400
Miscellaneous	<u>1,200</u>	<u>1,000</u>	<u>1,700</u>	<u>1,000</u>	<u>2,600</u>	<u>2,300</u>	<u>1,100</u>	<u>4,200</u>	<u>2,200</u>	<u>3,800</u>
Total	18,600	18,000	22,200	13,500	35,600	27,000	15,700	28,500	18,000	19,000

^{1/} Source: DWR Technical Information Report Nos. 79-1, 80-1, 81-1, 82-1, 83-1, 87-1, 90-1, 94-1, 96-2, and this report. This table includes only data for the upper 11 miles of Indian Creek, Antelope Dam to Flournoy Bridge.

Total use and the distribution of individual activities were not markedly different than observations made in many previous years. No single activity appeared to be responsible for the 1999 increase in the “miscellaneous” category. There appear to be large percentage differences for all of the individual miscellaneous activities, but observed use is too low for such comparisons to be statistically meaningful.

Ten years of surveys, a period that included a wide range of streamflow conditions, have revealed that angling success is often higher and more anglers are attracted to Indian Creek in years when Antelope Reservoir spills and summer flows are maintained at 20 cfs, than in years with low flows (Table 3). Anglers expect that large trout will leave the reservoir when it spills and fishing will be good downstream. The catch per hour and total catch of rainbow trout can roughly reflect the number of trout entering the stream at the time of spill, and several years of lower rainbow catch reflected reduced reservoir planting between 1992 and 1996. However, increased planting has occurred since 1998. Fishing success for brown trout had normally remained

about the same irrespective of angling pressure, but in 1995 and 1999 it was unusually low. The readiest explanation of low brown trout catch may be a reduced population (Brown 1996; Brown 2000) following successive record floods in 1995 and 1997.

Table 3. Streamflow and Estimated Angler Use and Catch in Upper Indian Creek, 1978-82, 1986 and 1990, 1993, 1995, and 1999^{1/}

<u>Year</u>	<u>Streamflow Conditions</u>	<u>Angler Hours</u>	<u>Brown Trout</u>		<u>Rainbow Trout</u>	
			<u># BN Caught</u>	<u>Catch/ Hour</u>	<u># RT Caught</u>	<u>Catch/ Hour</u>
1978	Spill 46 days and 20 cfs	7,000	3,465	0.50	1,400	0.20
1979	Spill 20 days and 10 cfs	3,400	1,330	0.39	410	0.12
1980	Spill 177 days and 20 cfs	8,800	2,950	0.34	2,835	0.32
1981	No spill and 10 cfs	3,600	1,400	0.39	200	0.06
1982	Spill 237 days and 20 cfs	13,500	4,300	0.32	4,780	0.35
1986	Spill 123 days and 20 cfs	7,600	2,700	0.36	2,500	0.33
1990	No spill and 10 cfs	6,200	2,120	0.34	1,830	0.30
1993	Spill 102 days and 20 cfs	6,200	1,900	0.31	1,000	0.16
1995	Spill 154 days and 20 cfs	4,100	800	0.20	500	0.12
1999	Spill 69 days and 20 cfs	4,600	800	0.17	1,400	0.30

^{1/} Source: DWR Technical Information Report Nos. 79-1, 80-1, 81-1, 82-1, 83-1, 87-1, 90-1, 94-1, 96-2 and this report. This table includes only data for the upper 11 miles of Indian Creek, Antelope Dam to Flournoy Bridge.

In previous years, most of the exceptionally large fish observed in the creel census were caught on opening weekend and early in the season. In 1999, due to delayed spill, fishing success was unremarkable on opening weekend. Larger fish appeared in the creel census later in the year, as spill continued through June. The census data reveal that four of 11 trout over 40 cm were taken on the opening weekend, and all 11 were caught by the end of May. The opening weekend usually has the highest angling use of the year, but this year accounted for only about 9 percent of the annual use. Local anglers (Plumas and Lassen County residents), who presumably know Indian Creek better than other anglers, have historically been somewhat more successful in catching trout than residents of other counties.

After the spilling ends, the higher maintained flows make the stream appear better for fishing and increased angler use normally continues. However, the use and catch rate in 1995 and 1999 were still lower than usual. This may be because since 1996, the outflow of water from Antelope Reservoir has often been maintained at 60 cfs during winter, whereas in many other years it had been 20 cfs. The recent higher winter releases have delayed the onset of spill, and did not allow passage of fish from the lake until after the opening of fishing season. This, combined with relatively low brown trout numbers, was the likely cause of lower angler use early in the season, and consequently a lower seasonal total because of the relative importance of early-season use.

ACKNOWLEDGEMENTS

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APPENDIX I

RECREATION SURVEY SCHEDULE FOR INDIAN CREEK, PLUMAS COUNTY APRIL 24, 1999, TO NOVEMBER 15, 1999

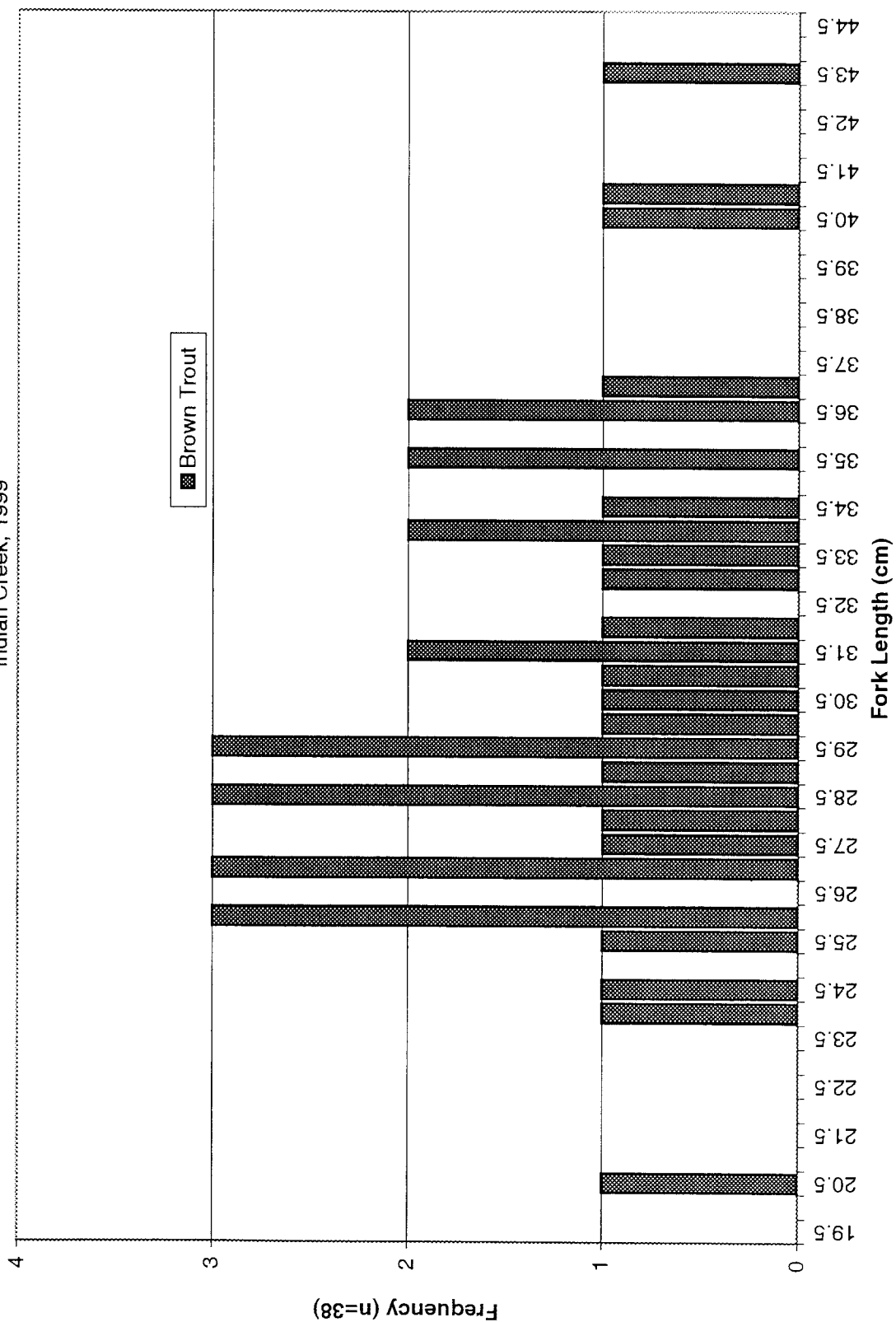
<u>Indian Creek Survey Dates</u>	Holiday = HD Weekend = WE <u>Weekday = WD</u>	<u>Survey Strata</u>
April 24	WE	I
April 25	WE	I
April 28	WD	IV
May 4	WD	IV
May 16	WE	III
May 23	WE	III
May 29	HD	II
May 30	HD	II
June 9	WD	IV
June 12	WE	III
June 16	WD	IV
June 26	WE	III
July 3	HD	IX
July 18	WE	V
August 3	WD	VI
August 14	WE	VI
August 19	WD	VI
August 20	WD	VI
August 21	WE	V
August 24	WD	VI
September 5	HD	IX
September 18	WE	VII
September 23	WD	VIII
October 2	WE	VII
October 20	WD	VIII
November 9	WD	VIII
November 14	WE	VII

APPENDIX II

1999 USE COUNT SCHEDULE FOR INDIAN CREEK

<u>Date</u>	<u>Daylight Hours</u>	<u>Use Count</u>		<u>Creel Census Time (approx.)</u>
		<u>Count</u>	<u>Time</u>	
April PDT	15-1/2	1st	0730-0830	0800-1200
		2nd	1000-1100	1500-1900
		3rd	1300-1400	
		4th	1530-1630	
		5th	1830-1930	
May-August PDT	16-1/2	1st	0700-0800	0800-1300
		2nd	1000-1100	1400-1900
		3rd	1300-1400	
		4th	1600-1700	
		5th	1900-2000	
September PDT	14	1st	0730-0830	0900-1300
		2nd	1000-1100	1400-1800
		3rd	1230-1330	
		4th	1500-1600	
		5th	1730-1830	
October PDT	13	1st	0800-0900	0900-1300
		2nd	1000-1100	1400-1800
		3rd	1230-1330	
		4th	1500-1600	
		5th	1700-1800	
November PST	12	1st	0730-0830	0800-1200
		2nd	0930-1030	1300-1700
		3rd	1130-1230	
		4th	1330-1430	
		5th	1530-1630	

APPENDIX III
Length-Frequency of Censused Brown Trout
Indian Creek, 1999



APPENDIX IV
Length-Frequency of Censused Rainbow Trout
Indian Creek, 1999

